LETTERS TO THE EDITOR.

German constructions.

I DISAGREE *toto coelo* with my learned fellow-citizen as to what he is pleased to call 'horrible construction' in German, but believe, on the contrary, that for one whose ear is trained to it the sentences of qualification are as clear as an assemblage of short phrases, and ever so much more powerful. As an example of the involved style (seldom if ever used by the best German writers and speakers, by the way), take this: —

Dem, der den, der die, das Verbot enthaltende Tafel abgerissen hat, anzeigt, wird hierdurch eine Belohnung zugesichert.

This is tough for the anti-Teuton, but it says in eighteen words and ninety-five letters what cannot be literally translated into English in less than nineteen words and one hundred and four letters.

PERSIFOR FRAZER.

Philadelphia, Feb. 8.

Inertia-force.

Will you allow me to draw attention to one point in Dr. E. H. Hall's recently published pamphlet on 'Elementary ideas, definitions, and laws in dynamics,' which he seems to me to have treated with less success than he has the other points raised?

On p. 6 Dr. Hall says, "We have spoken sometimes of the force which *is applied* to a body to change its motion, and sometimes of the resistance or counter-force with which the body meets the applied force. Each is necessary to the other. We could not exert force upon a body if the body offered no resistance. On the other hand, resistance would be impossible if there were no applied force to be met. We shall call the counter-force, which a body in virtue of its inertia exerts to meet a force applied, the *inertia-force*." On what body this counter-force is supposed to be exerted is not at once clear. At first it seemed to me to be the body by which the applied force was exerted, the applied force and the counter-force being thus the opposite aspects of the same stress. And this seemed especially probable from the fact that on p. 24 the third law of motion (which of course applies only to the two opposite aspects of one stress) is cited to prove the equality of the applied force (there treated as doing work) and the counter-force (there called a resisting force). But the following quotations show that this is not Dr. Hall's meaning: "The force, or resistance, exerted by a body varies greatly with the conditions of the experiment, being sometimes large, sometimes small, according to the following general law: When the ball's motion is changed slowly, it offers a slight resistance, — a small force suffices; when a considerable change is to be effected in a short time, we encounter a large resistance, — a great force is required" (p. 5); and, "There is no change of motion, and hence no inertia-force is developed" (pp. 6 and 7). The counter-force may thus become zero, though the stress still act; and hence it cannot be one aspect of that stress. The following quotation, however, seems to settle the matter: "If one of the opposing applied forces is greater than the other, the greater will prevail, and a change of motion will occur, occasioning an inertia-force, which will work *with* the smaller applied force *against* the greater" (p. 7). The inertia-force, therefore, is supposed to act on the body by which it is exerted.

The magnitude of this inertia-force is determined, according to Dr. Hall (see above quotation from p. 5), by the magnitudes of the forces applied to the body; and the following quotation — "The working force and the resisting force must also be equal" (p. 24) — shows that just sufficient inertia-force is called into play in any case to satisfy the conditions of equilibrium.

Now, this sounds very like the old notion of centrifugal force. It was formerly held that a body moving with uniform speed in a circular path was acted upon not only by a force directed towards the centre of the path, and applied, say, by means of a string, but also by an equal force directed from the centre, called the centrifugal force, and exerted on the body by the body itself, which was accordingly considered to be in equilibrium. Dr. Hall's inertia-force is thus just a generalization of the old notion of centrifugal force.

Although Dr. Hall thus proposes to re-introduce what seems to be an old error, the only evidence he brings forward for his inertia-force is the assertion contained in the first of the above quotations, that, of the applied and inertia-forces, each is necessary to the other. Yet he does not leave us without means of judging of his theory of the 'resistance' which bodies offer to applied forces; for according to his own account of this inertia-force, as shown above, it both acts on, and is exerted by, the same body. Now, on p. 18 he admits that "every force implies an action between *two* bodies." Hence the supposed inertia-force cannot be a force at all. And again, as we have seen above, according to Dr. Hall's own account, all bodies must be acted upon by equilibrating systems of forces, if this inertia-force be taken into account; and therefore, if this inertia-force be a force, a body's motion may be changing though it satisfy the conditions of equilibrium.

Apparently Dr. Hall has been led to postulate this inertia-force, because, 1°, he holds that a body resists an applied force (he even takes this to be a fact given in consciousness, for he says, p. 3, "One feels that the hand is *pulling*, that it encounters a *resistance*, which is offered in some way by the ball at the other end of the string"); and, 2°, he cannot understand a force as being resisted in any other way than by the exertion of an opposing force. I agree with him that the term 'resistance' should in dynamics be restricted to the opposition of forces. But the manifest consequence is, that a body ought not to be said to resist a force, and that Maxwell's queries, quoted by Dr. Hall (p. 32) — "Is it a fact that matter has any power, either innate or acquired, of resisting external influences? Does not every force which acts upon a body always produce exactly that change in the motion of the body by which its value as a force is reckoned?" — are to be answered, as Maxwell evidently intended them to be answered, the former in the negative, the latter in the affirmative, though some of his own definitions may be thereby shown to be worded in a faulty manner.

I hope I have not misrepresented Dr. Hall's position. I have read his pamphlet carefully several times, and can get only one meaning out of it. Were I reviewing the pamphlet, I would find many points to praise; and I draw attention to the above apparent error only because the excellence of the pamphlet generally is likely to cause it to take root and spread.

Dr. Hall, in his appendix, quotes a passage from Minchin's 'Uniplaner kinematics' which seems to

show that he has high authority for his inertia-force. But that Newton's *vis insita* or *vis inertiae* is quite a different thing from Hall's inertia-force, will be evident from the following quotations: "Haec" [vis insita] "semper proportionalis est suo corpori, neque differt quicquam ab inertia massae, nisi in modo concipiendi" (Newton's *Principia*, comment on def. III); and "Inertia and inertia-force must be carefully distinguished" (Hall's pamphlet, p. 6). Minchin's 'force of inertia' is just D'Alembert's 'effective force,' and is not a force at all, but simply the name given to the product of the mass of a particle into its acceleration. J. G. MACGREGOR.

Halifax, Jan. 31.

An Ohio mound.

In company with five young men from the public school of this place, on Saturday, Oct. 10, 1886, I assisted in the exploration of a mound, located in the northern part of Van Buren township, Shelby county, O., an account of which may be of interest to antiquarians.

Twenty-five years ago the mound was ten feet high, and twenty feet in diameter at its base. It was opened at that time by a Mr. Robinson, the owner of the farm, and a neighbor, but nothing was discovered by them beyond the fact that it contained a deposit of the fragments of bones, ashes, and red earth. A more careful examination, however, made by digging a trench four feet wide through it from east to west, revealed the fact that it was not only a place of deposit for dead bodies, but a place where human bodies were consumed by fire. A large portion of the interior of the mound is composed of calcined bones. Many of these bones, since their calcination, have been filled by carbonate of lime, and are now as hard and heavy as stone. There were, no doubt, a few copper implements or ornaments deposited with the bodies, as the bones are all highly colored with the salts of that metal. A careful examination, however, failed to discover specimens of the metal. A quantity of mica, sufficient to give the *débris* a glittering appearance, was found diffused through the entire mass. Deposits of red clay were found in different portions of the mound, of a deeper red than the red color produced by the action of fire.

One curious feature of the contents of the mound was the large number of balls found, varying from a half-inch to two inches in diameter. They have all been burned, and are of about the hardness of soft-burned bricks. The only relics found were a few small fragments of pottery and a green slate tablet three inches long, pierced by a hole at one end.

C. W. WILLIAMSON.

New Bremen, O., Feb. 3.

A method of labelling museum specimens.

The task of so labelling a collection of rocks, minerals, or similar objects, that their identity can in none but the most extreme cases be lost, is no light one. A common method now employed consists in painting a small area upon the object, which serves as a background upon which the serial number is again painted in a different color. Although the results thus obtained are lasting, the method is too laborious. Another common method consists in writing the requisite data with pen or pencil upon a slip of paper, which is then gummed to the specimen. This is, however, worthy only of universal condemnation.

After several years' experience in dealing with rock collections, I have adopted the plan given below, which is but a modification of that first mentioned. Its advantages are, ease and rapidity in application, legibility, and durability of results. The method, then, is briefly this: take common lead paint, of any desired color, and mix with ordinary varnish and a very little turpentine instead of oil. Apply with a brush over an area sufficiently large to accommodate the catalogue number, or whatever data it may be desired to put upon it. This quickly dries, giving a smooth, glossy surface. With very vesicular rocks, as some of the recent lavas, it is often best to even the surface by means of a little plaster-of-Paris, applied with a knife-point, before painting the stripe. Then take tube paints, — I use Winsor & Newton's lamp-black, — mix thin with turpentine, and with this and a common steel pen write the number on the surface prepared as above. If the paint is just the right consistency, — and this can be learned only by experience, — the numbers can be written almost as rapidly as with a pencil on paper. Both paints had best be mixed in watch-glasses, or some shallow vessel that can be readily cleansed, as they are, of course, useless after once having become hard and gummy.

On colorless crystals, such as quartz, the number can, perhaps, be best written with a marking-diamond. On smooth dressed specimens, as polished marble, the numbers can be written with pen and paint without the first stripe. On account, however, of the great diversity in color and texture of materials, I have found it best to adopt a uniform system for all, — a light-blue base with figures in black. Any other sufficiently contrasting colors will, of course, do as well. GEORGE P. MERRILL.

U.S. nat. mus., Feb. 5.

Fish parasites in Meleagrinae.

The occurrence of parasites or commensals in the pearl-oysters or mother-of-pearl shells has been known for a long time. Several years ago (1874), Professor Putnam of Cambridge described, in the Proceedings of the Boston society of natural history, Fierasfer dubius, a small fish common to both coasts of Central America, which sometimes inhabits holothurians on the Atlantic, and pearl-oysters on the Pacific side; and he referred to a specimen of the pearl-oyster in the Museum of comparative zoölogy, in which a Fierasfer is embedded in the nacreous substance of the shell.

In June last Dr. Gunther, at a meeting of the Zoölogical society (London), exhibited a similar specimen.

About a year ago, while examining certain material belonging to the Mexican geographical commission, I detected probably the same species enclosed in nacre in a pearl-oyster valve from the Gulf of California, and two, if not three, instances of another species of fish, apparently an Oligocottus (in the opinion of Dr. Bean), similarly enclosed. The occurrence of a crustacean, the pea-crab (Pinnotheres), under the same conditions, in a pearl-oyster shell from Australia, was made known to the Zoölogical society last April by Dr. Woodward. The forthcoming report of the national museum will contain a